

DEPARTMENT OF MATHEMATICS AND COMPUTATIONAL SCIENCES

BSc Honours Degree in Statistics Part IV

HSTS409

KRM

PANEL AND LONGITUDINAL DATA ANALYSIS: ASSIGNMENT 3

1 December 2024

Time : unlimited hours

Candidates should attempt ALL questions. Marks will be allocated as indicated.

A1. In a study to investigate weight loss programs, 100 male subjects were randomly assigned to maintain their current eating and exercise habits (Control), to follow a rigorous program of modified diet and exercise (Diet+Exercise), or to adopt a modified diet (Diet Alone). All participants were weighed at baseline (month 0) and then again at months 3, 6, 9, and 12.

(a) Using symbols for fixed effects, random effects, and residual error terms, write down two expressions (i.e., one for each program) describing the trend of weight loss in the two programs. Please use clear notation, making sure that all symbols used are defined. [15]

(b) An analyst considered a model with different linear time trends for the three groups and a random intercept to account for the correlation of the measurements. The following is part of the output

Random effects:

Formula: $\sim 1 \mid \text{id}$

(Intercept) Residual

StdDev: 18.46174 12.41623

Fixed effects: weight $\sim \text{prog} + \text{month} + \text{prog} * \text{month}$

Value Std.Error DF t-value p-value

(Intercept) 240.84412 3.591644 397 67.05679 0.0000

progDiet+Exercise 3.35374 5.344537 97 0.62751 0.5318

progDiet Alone -4.06149 4.943878 97 -0.82152 0.4134

month 0.54941 0.225814 397 2.43303 0.0154

progDiet+Exercise:month -7.98727 0.336022 397 -23.77009 0.0000

progDiet Alone:month -3.02327 0.310832 397 -9.72640 0.0000

(i) Write an explicit expression for the estimated population average trend for each of the three groups. Please be clear in your notation. [10]

- (ii) Give a numerical estimate of the difference of population mean weight after 8 weeks between the “Diet Alone” and the “Control” programs. [5]

END OF ASSIGNMENT 2 DUE 4 December 2024 16:00